

Alolkooy

Island Resource Issues



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Aliens on the Channel Islands!

By Steve Junak

The islands of Channel Islands National Park are renowned for their striking landscapes, their unique biological resources, and their isolation and solitude. Unfortunately, they are not as isolated as they seem, and their fragile ecosystems have been significantly damaged as a result of human activities.

Non-native plants now pose a serious threat to island ecosystems and native plant life. At least 200 non-native plant species (also known as alien or exotic plants, or simply as weeds) have reached the Park islands and established populations. Most of these exotic plants are well adapted to the insular climate, as they originally came from the Mediterranean region of Europe.

All of the Park islands now have significant numbers of weeds, with non-native plants representing from 20 to 33% of the total flora of each island. Over 170 species of weeds have reached Santa Cruz Island and now comprise about 26% of the island's total flora. Over 70 weed species have established populations on San Miguel (26% of the island's total flora), 100 on Santa Rosa (20%), 75 on Anacapa (28%), and 45 on Santa Barbara (33%).

The numbers and percentages listed above tell only part of the story, however. Weedy plants, especially annual grasses, cover extensive areas on each of the islands. Weeds, ranging from long-lived

trees to tiny annual herbs, can now be found in every plant community and in virtually every habitat. On Santa Cruz Island, a single weed species (sweet fennel) covers an estimated 10% of the island's surface!

Non-native plants compete with the native flora for habitats, moisture, nutrients, and/or pollinators. In some areas, they alter the environment

so much that few native species can survive. Weeds can cause significant changes in the ecosystem, affecting the aesthetics of an area, and altering fire, nutrient, or hydrologic cycles. Additional problems caused by weeds include unwanted hybridization with endemic plant species and unwanted habitat alterations which can affect native animals. For example, the seeds of non-native foxtails (*Hordeum* spp.) can become lodged in the eyes and noses of the island foxes, causing extreme discomfort and affecting their ability to survive.

Most weeds found on the islands have been carried there by ocean currents, wind currents, seabirds, and/or human travelers. Some were introduced as cultivated plants and then "escaped" from cultivation (e.g., chicory near Christy Ranch on Santa Cruz Island). Others have been introduced with motor vehicles, grading equipment, or contaminants associated with construction supplies (e.g., gravel) or agricultural activities (e.g., animals or animal feed).

Perhaps the most striking example of plant dispersal on the islands is giant reed, a European grass



Pozo Beach, Santa Cruz Island, looking west. A population of Bermuda buttercup was found on this isolated beach in 1993.

©1991 Steve Junak

introduced to California by the early missionaries. Giant reed is now an extremely invasive weed along stream courses in southern California; large populations thrive along the Santa Paula and Ventura rivers. During heavy winter storms, giant reed colonies are uprooted, and rootstocks have been transported to San Miguel, Santa Rosa, and Santa Cruz islands. Other plants carried to the islands by ocean currents include Bermuda buttercup, *Osteospermum fruticosum*, New Zealand spinach, and two species of sea rocket.

Channel Islands National Park has an ongoing concern about weedy plants, and an eradication program is in place. You can help preserve island ecosystems by carefully cleaning your clothing, camping gear, and especially your boots before crossing the Channel, or by becoming a volunteer in the Park to help with weed removal. You can also help by reporting new weeds to Park employees so that they can be eradicated before they spread. The battle with weeds is never-ending!

Steve Junak, herbarium curator at the Santa Barbara Botanic Garden, is the principal author of *A Flora of Santa Cruz Island*, published jointly by the Garden and the California Native Plant Society in 1995.



Sea rocket (*Cakile maritima*). This European beach plant spread up and down the west coast of North America at an average rate of 33 miles per year! Its seed capsules are resistant to salt water.

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The Channel Islands National Marine Sanctuary is part of the National Marine Sanctuary Program, established under Title III of the Marine Protection, Research, and Sanctuaries Act, as amended. For more information, contact: Sanctuaries and Reserves Division, Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 1305 East-West Highway, SSMC4, 12th Floor, Silver Spring, MD 20910.

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SANTA BARBARA MUSEUM
OF NATURAL HISTORY

CHANNEL ISLANDS



NATIONAL MARINE
SANCTUARY

From the Bridge

Ecosystem Management

By Ed Cassano, Sanctuary Manager

Resource protection is the first and primary goal of the Channel Islands National Marine Sanctuary. At the same time, we are committed to sustain-

able human use of the natural resources found in and around the Sanctuary. Toward this end, CINMS is working with sister agencies and user groups from an ecosystem management perspective. We believe that joint efforts to resolve ecosystem management issues will produce the best possible solutions for resources such as abalone and squid.

With this in mind, we want to encourage participa-

tion by all interested parties in two upcoming symposia. The Third International Symposium on Abalone Biology, Fisheries, and Culture will convene in Monterey on October 26-31. An Ecosystem Approach to Squid Harvest in California (cosponsored by CINMS) will be held October 28-30 at Lake Arrowhead. See "Things To Do" on page 12 of this issue for details on these important events. Hope to see you there!



© 1995 Steve Junak

Christy Beach,
Santa Cruz
Island, site of
a giant reed
population
(see p. 3).

Editor's Watch

Island Resource Issues

By Cynthia Anderson, Alolkoy Editor

In this issue of *Alolkoy*, we take a look at important issues that affect species in and around the Channel Islands National Marine Sanctuary. Weeds aren't just a problem of civilization; Steve Junak of the Santa Barbara Botanic Garden explains how weeds have invaded the Channel Islands and their effect on endemic plants. Marine biologist Peter Haaker examines the current condition of abalone, while Hillary Hauser presents a fisherman's view of what is being done to save the abalone fishery.

Next, we take a close-up look at squid biology and the squid fishery with Deborah A. McArdle, Marine Advisor at the UC Sea Grant Cooperative Extension Program, and fisheries consultant Mick Kronman. CINMS Research Specialist Sean Hastings covers squid resource management issues. Seabird biologist Paige Martin explores the dos and don'ts of kayaking around sea caves.

See Pod Press, our Kids' Page, for a tour of marine debris, and Sanctuary Waves for a summary of CINMS activities over the past few months.

Cover: Squid
fishing. ©1997
D.B. Pleschner.

Abalone at the Channel Islands

By Peter L. Haaker

Abalone are an important part of the Channel Islands marine fauna, and have been important in the economy from the earliest coastal dwellers to modern times. There are eight species, including the five most important covered here.

Lately, abalones have fallen on hard times. Valuable recreational and commercial fisheries once targeted abalones throughout California, but those fisheries have been closed. This article summarizes what has happened to abalone, and what is being done to reverse the trend.

Black Abalone

This species is intertidal, occurring throughout California. Studies by biologists in the mid-1980s found that a severe condition called withering syndrome (WS) had killed all sizes of this species. WS has been identified as a bacterial pathogen that interferes with digestive enzymes, causing death through starvation.

By 1990, WS resulted in almost total loss of black abalone. In 1994 statewide harvest was prohibited. While black abalone has not recovered, a few large, old individuals can still be found, and recently some small juveniles have been seen. These are signs that natural restoration may be under way.

Green Abalone

This high subtidal rocky species occurs from Baja California to Point Conception and on the warmer Channel Islands—Anacapa, Santa Cruz, southern Santa Rosa, Santa Barbara, Santa Catalina, and San Clemente. Green abalone sometimes share habitat with black abalone and are known to be affected by WS, but the extent of infection is unknown. This species is becoming rare in the Channel Islands. The fishery was closed in 1996.

Pink Abalone

Pink abalone occurs in warm water areas from Baja California to Point Conception in depths from 20 to over 100 feet. Nevertheless, populations are depleted throughout the islands. WS

occurs in pinks, but the extent is unknown. The fishery throughout California was closed in 1996.

White Abalone

This species is found on deep reefs and pinnacles in depths of 80 to 200 feet from Baja California to the northern Channel Islands. Scientists have conducted scuba diving surveys and deep searches using the Delta research submarine in the Channel Islands. Populations in deep water habitat once were as high as one per square meter. Recent surveys have found only a handful of live individuals at densities too low to maintain populations. White abalone may be on the verge of

extinction, and the species will probably require human intervention to recover. The fishery was closed in 1996.

Red Abalone

This cold water adapted abalone occurs in the cooler northern Channel Islands to northern California. Harvesting, oceanographic conditions, and sea otter predation have depressed populations. San Miguel is the last island where substantial populations exist, and the only remaining viable population of red abalone in southern California. Because of the closure of the other abalone fisheries in 1996, most fishing efforts shifted to reds. The red abalone fishery was closed in 1997 to protect remaining stocks and allow for the development of a management plan.

Outlook for Abalones

Abalones are beset by numerous problems, including disease, excessive harvest, and habitat-related changes. The first two factors have removed so many of the long-lived, slow-growing broadcast spawners that reproductive success cannot be assured. Other threats include the anticipated effects of El Niño: reduced growth and reproduction, increased disease, and a decline in kelp habitat.

Positive action to assure the future of abalone includes research on methods of population enhancement and improved management, which will contribute to recovery of the stocks.

The California Department of Fish and Game is currently working on a fishery management document for abalone. The goal is to actively take charge of the fishery and manage it. The success of this plan will depend upon an infusion of money from SB 463, the Thompson Bill, which will ensure a moratorium on abalone if signed by the governor this fall.

Peter L. Haaker is a Department of Fish and Game marine biologist, diver, and leader of the Nearshore Invertebrate Project.



Fish and Game biologists use a Delta submarine to search for deep water populations of white abalone.



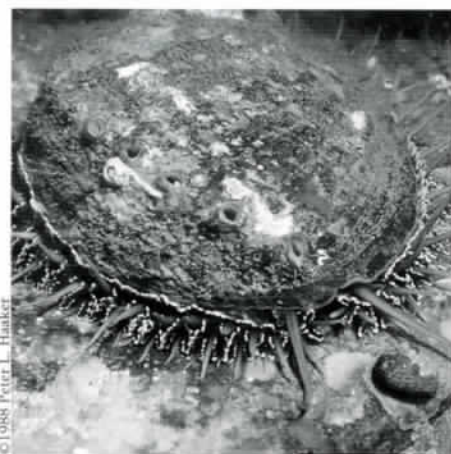
Left: Black abalone with WS (withering syndrome); right, a healthy black abalone.

The Future of Abalone

By Hillary Hauser

In May 1997, the California abalone fishery was shut down by the California Fish and Game Commission, which initiated an immediate moratorium on the take of abalone from San Francisco south to the Mexican border. SB 463, the "Thompson Bill," may be set in place by January 1998 to keep the Southern California abalone off-limits to all. No abalone for anyone—not for commercial divers, sport divers, free divers, or restaurant-goers.

Meanwhile, the abalone fishermen are working harder than ever to restore their fishery—not only because they want their business back, but because they feel the tragedy of a fishery dying from a combination of disease (withering foot syndrome), environmental onslaught (El Niño 1983), and yes, overfishing—both commercial and sport.



Top: green abalone; bottom: red abalone.

The abalone, however, is a unique animal. While some fish populations are hard to augment, scientific studies have shown that abalone can be easily induced to spawn, that larval seed can be successfully spread over reef areas, and that baby abalone can be hand-planted in the wild to good effect.

With this in mind, abalone divers have been working with the Fish and Game Department for years on restoration projects—and now that the moratorium is in place, their efforts are redoubled. The fishermen have been putting their efforts into fine-tuning the language of the Thompson Bill, rather than fighting it. They believe the legislation might provide a good foundation for the rebuilding of their fishery.

SB 463 dictates that the abalone moratorium shall stay in place until "a fisheries management plan is put into effect." The California Abalone Association (CAA) is lobbying for a management plan that will bring the abalone populations back.

CAA spokesman Jim Marshall said that management needs to be "one hundred percent" in the hands of the Fish and Game Commission, rather than split between the commission and the state legislature. The legislature, CAA feels, is ill-equipped to deal with fishery management issues.

"Then we need to scrap all existing laws and start over—regarding size, seasons, limits," Marshall said.

To start over, good, accurate data is needed on the size of the resource and the reproductive nature of the abalone, "to find out at what point the abalone can be fished, and at what level, without harm to the resource," Marshall said. "We need to work out a Total Allowable Catch (TAC) that will allow for the restoration of the abalone population."

In the meantime, reseedling is necessary. CAA is pushing for a major plant of 30 million abalone at the Channel Is-



Black abalone habitat off San Miguel Island.

lands and along the Southern California coast beginning in July 1998, using an experimental technique developed by UCSB graduate student Jessie Altstatt and Peter Raimondi at UC Santa Cruz. Funded by the Abalone Restoration Tax, planting would be done at 14-16 sites in the Channel Islands, 2-3 sites along the San Diego coastline, and 2-3 sites near San Mateo.

There has been a major interference in reseedling plans because of an accidental importation of sabellid worm, a parasite, to California waters. (Maricultured abalone brought here from South Africa were not quarantined.) CAA has made progress on this front, however, by getting a couple of hatcheries certified as "sterile" (worm-free).

Another significant issue is establishing a quota for the sport take of abalone. CAA secretary Harry Liquornik said sport divers are currently taking two million pounds of abalone per year from the California north coast—four times last year's commercial take from Southern California.

These are the hurdles commercial abalone divers are tackling in order to get their fishery back. They feel it's possible, with hard work, to build an abalone resource that will benefit not only themselves, but everyone else, too.

Hillary Hauser has written about the sea in numerous books, newspapers and magazines for over thirty years.

From the Deep to the Shallows: California Market Squid

By Deborah A. McArdle

Only one species of squid makes the journey from the deep waters of the Pacific to the California coastline to mate, spawn and die—the California market squid, *Loligo opalescens*.

California market squid are mollusks subdivided into the highly specialized Class Cephalopoda (head-footed ones) that also includes the nautilus, cuttlefishes and octopods. Being predators, many of their adaptations reflect their carnivorous habits. Like most top predators, squid need to range widely in search of food. Although squid are strong, fast swimmers, their method of locomotion is very different from that of other ocean swimmers. Squid use a unique method of jet propulsion.

The squid's internal shell or "pen" is a mere dorsal strip or ribbon of hornlike material. With the partial loss of the shell, the entire squid body can contract freely, a feature that enhances locomotion. To move, squid suck water slowly into their bodies and then forcefully expel it through a funnel. Squid usually move backward, but they can also hover, glide, or shoot through the water with unnerving speed using their two triangular fins to steer.

Some squid species use jet propulsion to actually "fly" out of the water. Flying squid have been found on the decks of ships some 3.5m above the surface, and their flight can be up to 50m in length. To avoid capture, squid eject a cloud of ink that confuses their enemies and conceals their escape. When squid are excited or frightened, they transform their normal bluish-white color. Tiny chromatophores, or spots, in their thin, translucent skin expand and the animal turns white, then shades of gold, green, orange and pink, and finally a deep red. Total transformation can take place in less than one second.

To spot prey (mainly small fish) and predators, squid have well-developed eyes that match the human eye in complexity. Squid can focus on objects, adapt to light intensity, form images and perceive colors. They also have a sophisticated sense of touch on eight long, sucker-bearing tentacles. Two additional tentacles can shoot out to grasp prey and then rapidly retreat.

Using these adaptations, California squid are effective predators. They often swim rapidly backward into a school of fish and capture prey with their tentacles. Their chitinous jaws, operated by strong muscles, can crush even hard prey with a single bite. Once the fish is paralyzed, the squid bites it into pieces small enough to pass into its digestive system.

In turn, squid are a vital link in the food chain, eaten by birds, mammals and fish. Because of their importance as a food

An abundant harvest. Southern California's market squid fishery has reached record levels.



source, a population decline could have serious ripples throughout the food chain.

Squid's link in the food web ends, as does their life, when they move inshore to spawn over shallow, sandy bottoms and rocky outcroppings. Southern California squid populations spawn in the fall and winter, whereas northern California squid spawn in the spring and summer.

Mating behavior often involves elaborate courtship in which both animals display dramatic color changes and body movements. Once fertilized, tens of thousands of squid lay sticky egg bundles of up to 20,000 eggs on the seafloor. After spawning, squid die, and the juveniles emerge 3-5 weeks later.

The habits of immature squid, and the movements of populations between the time of hatching and return to spawning grounds, are virtually unknown. Squid travel from inshore to deeper water and rapidly mature in 12-15 months. Upon maturation, squid once again complete the ecological cycle by returning inshore to mate, spawn and die.

Deborah A. McArdle is Marine Advisor at the UC Sea Grant Cooperative Extension Program, Santa Barbara, CA.

California Marine Protected Areas

In California alone, over 100 ocean areas have been set aside as Marine Protected Areas (MPAs). A new 282-page book, *California Marine Protected Areas*, is the first publication to collect and organize all available information on these vitally important areas.

Author Deborah A. McArdle is Marine Advisor for San Luis Obispo and Santa Barbara counties of the UC California Sea Grant Cooperative Extension Program.

To order, please send a \$13 check or money order, payable to UC Regents, to: Deborah A. McArdle, UC Sea Grant Cooperative Extension, 105 E. Anapamu #5, Santa Barbara, CA 93101, or call (805) 882-1889.

Squid Fishery: A Nighttime Affair

By Mick Kronman and Deborah A. McArdle

Squid fishing in California began in 1863, when Chinese fishermen in Monterey Bay used blazing torches to attract squid (*Loligo opalescens*) to the surface at night. Between 1923 and 1932, landings in the region averaged 2,000 tons per year, then climbed to 19,000 tons by the end of World War II. Landings varied considerably on a year-to-year basis, depending on ocean conditions and market demand. This variability holds true today.

Monterey's squid fishery occurs during late spring and summer, while Southern California's squid fishery occurs during fall and winter. Southern California's squid fishery began in the 1950s. Boats illuminated the sea surface to attract squid, then fishermen scooped (or "brailed") them aboard with large ring nets assisted by winches and booms.

Catalina Island had the primary fishing grounds, and it remains a productive fishing area today. Later, fishing grounds were discovered at the Northern Channel Islands, primarily Santa Cruz and Santa Rosa. Squid were also found along the coast at Point Conception, Gaviota, Hueneme Canyon, Mugu Canyon and Decker Canyon. These areas are spawning grounds where squid congregate to lay their eggs and die.

As overseas market demand increased, and as opportunities in other fisheries declined, Southern California's squid fishery matured. In the late 1980s, dramatic changes brought the fishery into its modern form. Small scoop-boats gave way to large purse seiners, which encircle a school of fish with a net, then "purse" the bottom of the net to seal off any avenue of escape. The net is bunched up until the bottom (or "sack") comes alongside the boat. Then the squid are pumped hydraulically from the net into the fish hold, where they are chilled with ice, refrigerated seawater, or both.

At first, purse seiners used lights aboard the vessel to

attract the animals, then encircled them with the net. This changed in the early 1990s, when fishermen added smaller "light boats," whose sole job is to locate squid with depth sounders, then illuminate the surface with 15,000-30,000 watts. When the squid congregate near the surface, the purse seiner moves in and makes a "set."

This joint-effort technology, an increased number of participants (153 vessels in 1996) and the discovery of new fishing grounds have elevated Southern California's modern-day squid fishery to record levels. Statewide landings have increased from 61,000 tons in 1994 to almost 90,000 tons in 1996. Expanding markets—especially in China where squid imports rose 17-fold during the past two years—have helped fuel the trend. Squid was the state's most valuable fishery in 1996, bringing in \$33 million to fishermen alone. Ninety-four percent of the squid landed came from Southern California.

Concern has been raised about the ability of squid to withstand this dramatic increase in fishing. Little is known about the population biology of squid, except that their numbers stretch from Canada to Mexico and can fluctuate widely year to year. The large-scale fluctuations may be due, in part, to fishing pressures and changes in oceanographic conditions (for example, El Niño brings abnormally warm water to the California coast and makes

squid less available for harvest locally).

More research is needed on the distribution, abundance, and population structure of market squid along the Pacific Coast to determine the viability of the population and the sustainability of the resource.

A former fisherman, Mick Kronman is a Fisheries Consultant and field editor for National Fisherman magazine. Deborah A. McArdle is Marine Advisor at the UC Sea Grant Cooperative Extension Program, Santa Barbara, CA.



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A "light boat" illuminates the waves to attract squid to the surface.

Squid: An Ecosystem Perspective

By Sean Hastings

The harvest of market squid within the Channel Islands National Marine Sanctuary has reached epic proportions in the last five years. In 1996, the squid fishery was the top fishery in volume and economic value in California, with a majority of the harvest centered in the northern Channel Islands (see article on page 7).

Squid play a vital role in the California Current ecosystem, serving as a major link in the food chain as both predator and prey. A variety of seabirds, including sooty and pink footed shearwaters, western gulls, and common murrelets, dive for squid. A majority of the marine mammals in the Sanctuary, including California sea lions, elephant seals and Risso's dolphins, depend on squid as well. Several fish species, including many that support other fisheries (like yellowfin tuna and halibut), depend on squid as a food resource. Squid are considered voracious predators, preying on copepods and small fish species.

A shift in squid biomass—either due to harvesting, or to oceanographic conditions, like the upcoming El Niño—can send ripples throughout the ecosystem. Resource management agencies, like CINMS and the Department of Fish and Game, are tasked with balancing multiple, often conflicting goals of protecting all species and ensuring a sustainable harvest of targeted species. Effective management requires considering the ecological impacts of harvesting on the entire ecosystem.

Fishery management is not about managing fish, but about managing people. We cannot change El Niño events, but we can work to understand the effects of El Niño on squid biomass as well as the effects of other oceanographic and biological conditions on squid. With a greater understanding of these pieces of nature's puzzle, we can adjust our management and harvest strategies to reflect changes in the environment.



Purse seiners at work setting their nets.

Squid serve as an important protein source to millions of people in the Mediterranean countries, Asia and the United States. The goal, then, should be to harvest squid sustainably so that there are enough squid for people and enough squid to fill their niche in the environment in perpetuity.

Currently a variety of

Federal and State bills and management options, including California State Senate Bill 364 (the Sher Bill) are being considered to accomplish this goal. For the latest developments regarding state squid legislation, visit the World Wide Web at <http://www.leginfo.ca.gov/>. Then look under "Bill Information" and enter the number of the bill, or the word "squid."

Unlike many fisheries, squid is considered a relatively "clean" fishery with very little bycatch reported in the catch. While this makes one management issue less troublesome, there remain several questions about other ecological impacts from fishing. For example, do the light boats that turn "night into day" to draw squid to the surface disturb nesting seabirds? Does the harvest of squid (90,000 tons in 1996) have an impact on the squid population or the species that depend on squid?

The fact is that researchers and resource managers simply don't know how much squid is out there and how the population fluctuates. Several research institutions and researchers, from Scripps Institute in San Diego to Moss Landing in Monterey, are beginning to research squid population dynamics and the squid's role in the California Current ecosystem. Resource managers, fishermen, processors and researchers are coming to the table to discuss what is known, what is unknown and how to manage this burgeoning fishery. See "Things To Do" on page 12 of this issue for details of the upcoming Squid Symposium in October.

Sean Hastings is Research Program Specialist at CINMS.



Fishermen supervise the pumping of squid into the boat's fish hold.

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Sanctuary Waves

How To Find Us

This spring the Channel Islands National Marine Sanctuary made a long-awaited move to new offices in the Naval Reserve Building at 113 Harbor Way. Stop by and visit us! Look for the bright blue door on the back side of the building, near the construction zone. Our phone number remains the same, (805) 966-7107.

Staff Updates

Bob Schwemmer has joined CINMS as Cultural Resources Coordinator through a cooperative agreement with the Santa Barbara Maritime Museum. Schwemmer also serves as President of the Los Angeles Maritime Museum Research Society and as Vice President of Research for the Coastal Maritime Archaeology Resources Group.



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Sean Hastings serves on the CINMS staff as Research Program Specialist. Originally from Del Mar, California, he earned his bachelor's degree in environmental studies at the University of California, Santa Cruz and is completing his master's degree in marine affairs at the University of Washington.

Kathy Vargas is the new Administrative Assistant in the CINMS office. She moved to Santa Barbara one year ago from the San Jose area. We're very happy to have Kathy on board!

Lt. Matthew Pickett is the new pilot of the joint patrol aircraft shared by CINMS



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New CINMS staff members Sean Hastings, Kathy Vargas and Lt. Matthew Pickett.

and the Monterey Bay National Marine Sanctuary.

Coastal Commissioners Cruise the Sanctuary

Twelve Coastal Commissioners for the State of California visited the Channel Islands National Marine Sanctuary and Santa Cruz Island on August 15 aboard the Sanctuary's research vessel *Ballena*. The commissioners were treated to sightings of gigantic blue whales, humpback whales and dolphins, as well as a tour of the Santa Cruz Island Preserve.



©1997 CINMS

California Coastal Commissioners visited the Sanctuary on August 15 aboard the RV *Ballena*.

Coastal Cleanup Day

On September 20, the Marine Educators' Regional Alliance (MERA), of which CINMS is a member, participated in the 13th Annual California Coastal Cleanup Day. MERA hosted a Community Celebration and BBQ at Leadbetter Beach, plus a press conference with American Oceans Campaign Co-Founder Ted Danson. At the press conference MERA representatives announced the criteria for the first annual MERA Award, which will recognize the contribution of an individual or organization to marine education.

CHIMES Report

The Channel Islands Marine Ecosystem Survey (CHIMES) is entering its fifth month of observation cruises throughout the Sanctuary. During three-day cruises along the north sides of San Miguel, Santa Rosa, and Santa Cruz islands, researchers from the Sanctuary and UC Santa Cruz map oceanographic patterns, zoo-

plankton density, and marine bird and mammal distribution.

So far CHIMES has plotted the abundance and distribution of euphausiid patches (krill), and well as documenting blue and humpback whales, common and Risso's dolphins, California sea lions and sea birds including sooty and pink footed shearwaters, red necked phalaropes, Cassins auklets and western gulls.

For more CHIMES information please visit the CINMS web site under Research (see web address on back cover).

RV *Ballena* Activities

The RV *Ballena* spent the months of June through August continuing to support research efforts for the Plumes and Blooms project as well as CHIMES (Channel Islands Marine Ecosystem Survey). The *Ballena* also supported National Public Radio in collecting sounds from the Sanctuary for Radio Expeditions, which aired on October 6.

McArthur Research Cruise

Keep an eye out in the Channel for the 175-foot NOAA ship *McArthur* at the end of October! CINMS has the good fortune of using eight days of ship time from October 22-30, 1997 in partnership with the National Marine Fisheries Service Southwest Fisheries Science Center. The *McArthur* will be home to Plumes and Blooms scientists and aid in changing UC Santa Barbara's long-term research buoy.

LFA Project

Recently CINMS took part in an experiment conducted for the Navy on an active Low Frequency sound project, the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA). The Navy provided a ship and this system to researchers to determine its potential effects on marine mammals, specifically large baleen whales (blue and humpback). CINMS provided technical as well as programmatic comments regarding the experiment's design and its potential impacts. This experiment took place on San Nicolas Island from September 13-October 12.

Kayaking and Wildlife: A Sensitive Mix

By Paige Martin

Sea kayaking is a great way to see wildlife, no doubt about that. But few people realize they can harm the wildlife they are trying to see.

Marine mammals and sea birds may be disturbed in resting, foraging and breeding grounds long before you see them. However, it is possible for the attentive kayaker to avoid many of these situations or, at the very least, to minimize a disturbance event.

In the 1970s, the Marine Mammal Protection Act and the Migratory Bird Treaty Act became law and prohibited harming or disturbing mammals and birds. Several species are coming back from the brink of extinction. Even though you just want to watch them, remember that this is the last place for many of these creatures to live in quiet seclusion. It is far more rewarding to stay back and watch an animal's natural routine than to chase it away.

Pinnipeds (seals and sea lions) "haul out" in the rocky intertidal zone where the sea meets the cliffs. Resting animals are often encountered by kayakers and boaters. If an animal appears agitated or starts watching you, then you are too close. Sit calmly at a safe distance. Let the animal's natural curiosity take over, and it may approach you.

Some seabirds use sea caves for nesting, and any human presence in these caves can cause stress. Nests under rock piles, under piles of debris and even out in the open may be stepped on or crushed in the dim light of the caves. Cormorants and pelicans are disturbed easily and may knock their eggs out of nests or abandon them if they are flushed suddenly from a cliffside. Adult birds will stay away from the nest while people are in the area, and the eggs or chicks may overheat in the sun without protection. Gulls and ravens will take advantage of a disturbance to steal eggs and chicks. Entire colonies have been lost to these disturbances.

Imagine how you feel when you sense a stranger lurking. Animals experience this same anxiety as a stress which may deplete vital energy reserves for nesting and survival. Until they fell prey to hunters and eggers in the 1800s, marine animals off the coast of southern California may have been as approachable as their arctic, antarctic and equatorial counterparts. Those who learned to be afraid of humans survived, and it is their descendants you encounter on a visit to Channel Islands.

You can minimize your impact on wildlife and have a rewarding experience by following the guidelines in the box at the right.

Paige Martin is a seabird biologist at Channel Islands National Park.



Kayaking safety means wearing helmets and life vests as well as not disturbing wildlife.

Guidelines for Kayakers

(From the Channel Islands National Park Kayaking Site Bulletin)

- Avoid approaching areas with birds, seals and sea lions that are roosting, nesting or pupping. Look ahead and give animals a minimum 100-yard clearance.
- On San Miguel and Santa Rosa islands, the snowy plover, a threatened shore bird, makes its nests on sandy beaches from mid-March to mid-September. Nesting areas must be avoided at those times.
- Pupping harbor seals, sea lions and other pinnipeds are sensitive to any type of human disturbance and may abandon their pups. In addition, all of these animals are easily disturbed when resting or preening on rocks or secluded beaches. Rest periods are important to their energy budget. Approach new territory slowly. If you see animals close by, quietly move away.
- It is recommended that visitors stay out of sea caves, including dry caves behind beaches, during the spring and early summer when sea birds are nesting.